

he published a valuable work on embryology. About 1860 he was nominated professor of physiology, and two years later he was appointed to a newly founded chair of pathology. He was also appointed consulting physician to Princess Margherita, mother of the present King. Throughout his career he worked hand in hand with his colleague Tommasi. Gaetano Giorgio Gemmellaro was born at Catania in 1832. At the age of twenty he produced his first paper on certain volcanic minerals from Patagonia, and from then onwards published papers almost continuously for fifty years. The geological history of Sicily was almost made by him. He was professor of geology and mineralogy at Palermo, a member of the Accademia dei Lincei and of many other academies of different countries, one of the "Forty" of the Italian Society of Science, a Senator, and Knight of the Order of Savoy. Prof. Giustiniano Nicolucci was born in the island of Liri, and graduated in medicine at Naples in 1843. Under Stefano delle Chiaje he developed a taste for biological science, and in 1842 published his first paper on the structure and functions of the human cerebral nerves. During the political disturbances he left his country, and three years later returned to practise medicine. The various types of humanity with which he came in contact in his profession attracted his attention to the study of anthropology, which he continued to his last day. His researches dealt with both historic and prehistoric anthropology, his favourite theme being the prehistoric anthropology of Italy, and especially of southern Italy.

A NEW and revised edition of "Object Lessons in Elementary Science," by Mr. Vincent T. Murché, has been published by Messrs. Macmillan and Co., Ltd., in two parts at 2s. each.

THE "London University Guide and University Correspondence College Calendar" for 1905 contains in a convenient form the kind of information required by a private student desirous of taking a degree at the University of London.

MR. HEMMING'S book entitled "Billiards Mathematically Treated" has reached a second edition, which has just been published by Messrs. Macmillan and Co., Ltd. In appendix iii. of the new edition Mr. Hemming institutes a comparison of strokes played through and fine, and of the margin of error in each case.

MESSRS. WHITTAKER AND CO. have published a third edition of "The Optics of Photography and Photographic Lenses," by the late Mr. J. Traill Taylor. The short chapter on lenses of Jena glass which was included in the last issue of the book has been omitted, and one on anastigmatic lenses, written by Mr. P. F. Everitt, inserted in its place.

AN authorised translation, by Dr. M. Ernst, of the presidential address delivered by Mr. Balfour at the Cambridge meeting of the British Association has been published by Herr J. M. Barth, Leipzig, under the title "Unsere heutige Weltanschauung." Dr. Ernst has rendered the address into fluent German, and has added a few short descriptive notes—mainly of a biographical character—which will be of interest to readers unfamiliar with the names of Newton, Cavendish, Stokes, Maxwell, Kelvin, Rayleigh, and other natural philosophers to which reference is made. In the first note, on the foundation and objects of the British Association, the list of sections should have included the section of educational science.

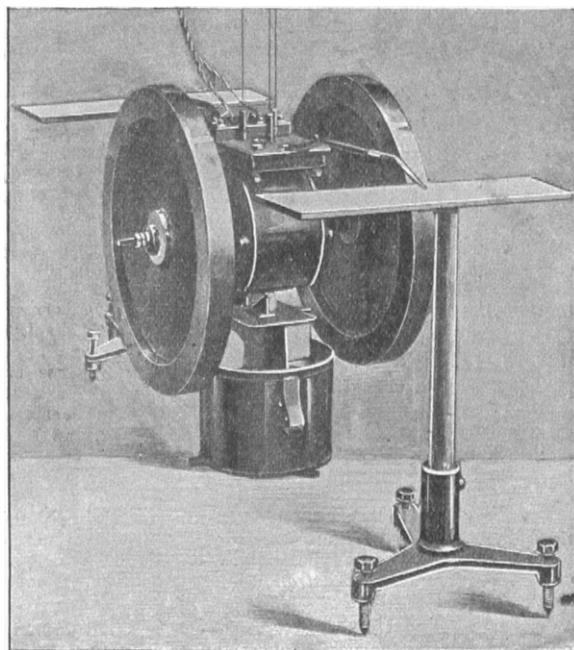
THE "Notes on Shooting, with Instructions Concerning the Use of Nitro-Powders," written by "An Expert," and published by Messrs. Curtis's and Harvey, Ltd., has reached

an eighth edition. This little volume of 83 pages has been completely re-written, and now contains a practical account of the results of recent researches in sporting gunnery. The actions of guns and gunpowder are based on the laws of physics and chemistry, and the results which have followed the application of the scientific method to the problems in connection with this branch of technology have been incorporated in the book. The volume provides evidence that manufacturers are coming to realise that substantial advantages in their work follow an acquaintance with results arrived at by the man of science. The six chapters into which the book is divided deal with smokeless powders and the methods of testing them, with patterns on the distribution of pellets on the target, with cartridge shooting, and aiming at moving objects.

OUR ASTRONOMICAL COLUMN.

APPARATUS FOR MEASURING THE VELOCITY OF THE EARTH'S ROTATION.—Prof. A. Föppl, of the Munich Technical High School, has devised a new gyroscopic apparatus for measuring the angular velocity of the earth's rotation.

As shown in the accompanying figure, the apparatus consists of a large top carrying at each end of a horizontal



spindle an iron wheel 50 cm. (19.7 inches) in diameter and 30 kilograms (66.1 lb.) in weight. This spindle is the axle of a small electro-motor which is capable of turning the wheels 2400 revolutions per minute. The whole framework is suspended by three fine, strong steel wires to the ceiling of the room in which the experiment is performed, and a cross piece immediately under the centre of the axle dips into a bath of oil, thereby deadening the subsidiary interfering oscillations. The angle through which the whole apparatus turns about its vertical axis is read off, on the two scales shown in the figure, to about the tenth of a degree.

To perform the experiment the current is disconnected from the motor, and the latter run as a generator for a short period, when a reading of a voltmeter placed in circuit enables the angular velocity of the revolving wheels to be found. Knowing this, one deduces the moments of inertia of the turning masses, and then by an equation which takes for its arguments the combined moment, the constant angular velocity of the wheels, the torsion of the trifilar

suspension, &c., one may calculate from the observed readings, taken from the scales each minute of the quarter or half an hour that the wheels continue to revolve at a constant rate, the angular velocity of the earth's rotation.

For this quantity Prof. Föppl has obtained a value within 2 per cent. of that obtained from astronomical phenomena, and hopes, with the assistance of M. O. Schlick, the maker of the apparatus, to obtain a still more accordant value by further modifying and perfecting his device (*Revue générale des Sciences*, No. 19, October 15).

THE PERSEID SHOWER.—Mr. A. King sends an account of his observations of Perseid meteors during July and August. The observations were divided into two periods, namely, (1) July 12 to 18 inclusive at Sheffield, (2) August 3 to 18 inclusive at Leicester.

The total time spent in watching was twenty-one hours. Considerably more than 200 shooting stars were seen, of which nearly 130 were Perseids; 152 meteors were noted, about 80 being Perseids. The maximum of the shower seems to have occurred on August 11, or in the daylight hours of the morning of August 12. By August 14 the strength of the shower had much decreased, but on the following night there was a recrudescence of Perseid activity, for within the first fifteen minutes of a watch from 10h. to 11h. two beautiful Perseid fireballs, both nearly equalling Jupiter in brilliance, appeared, and altogether the hourly rate of Perseids was higher than on August 14. Mr. King considers that the display was scarcely so strong as of late years, but still was a fairly rich one. The following positions were obtained:—August 6, α 38, δ +56½ (10 meteors); August 11, α 45½, δ +57½ (35 meteors); August 12, α 46½, δ +57½ (13 meteors); August 14, α 50½, δ +58½ (7 meteors).

The movement of the radiant is thus well shown. In conclusion, Mr. King says:—"All the brilliant Perseids had pear-shaped heads. Of 47 Perseids the colours of which were recorded 31 were yellow, a few of these having a greenish tinge. The tints of the streaks usually eluded observation, but the streak of a bright Perseid which appeared on August 13 was muddy."

THE DUMB-BELL NEBULA.—From a special study of the various forms of nebulae which he has photographed with the Meudon reflector, M. Louis Rabourdin has arrived at the conclusion that the dumb-bell nebula may be correctly classified as elliptical, and that the ring nebula in Lyra should also be placed in the same category.

On comparing a number of photographs of these two objects he found that they have the same elliptical form, and that the stars enclosed in each are, generally speaking, similarly arranged. Consequently, he believes them to be objects which started with the same primal form, but have arrived at different stages in the order of their evolution.

Several other well known objects are placed by him in the same class, and he suggests that the nebulae generally may be of two general types only, viz. elliptical and spiral (*Bulletin de la Société astronomique de France*, October, 1903).

HARVARD COLLEGE OBSERVATORY.—In a small brochure published by the Harvard College authorities (Cambridge, Mass., 1904) the establishment, growth, and work of the college observatory is briefly recorded. The various stations and the instruments located in each are named and described, and the work already performed, the publications of the observatory, and the officers employed are mentioned in chronological order. Two reproductions of photographs show the stations at Cambridge and Arequipa respectively.

In a second similar publication Prof. E. C. Pickering outlines the second part of his "Plan for the Endowment of Astronomical Research," in which he suggests several methods of usefully spending the money he is seeking to raise for this purpose. Among other things he discusses solar eclipse expeditions, and states that the English method of organisation by means of a central permanent eclipse committee is one which might be usefully copied in other countries, where much money has been "wasted" by sending out a number of mutually independent expeditions, often in charge of incompetent persons, to attempt to obtain results which are but seldom adequately discussed or published.

IRON AND STEEL INSTITUTE.

THE opening meeting of the Iron and Steel Institute was held on October 24 in New York under the presidency of Mr. Andrew Carnegie. Addresses of welcome were delivered by the Mayor, by Mr. John Fritz, chairman of the reception committee, and by Mr. James Gayley, president of the American Institute of Mining Engineers. On behalf of the council Sir James Kitson presented to Mr. Carnegie the Bessemer gold medal in recognition of his great services to the iron and steel industries of the world. On October 26 a selection of papers was read and discussed.

The first and most important read was that by Mr. James Gayley (New York) on the application of dry air blast to the manufacture of iron. The variable moisture in the atmosphere has long been recognised as a barrier to further progress in blast furnace practice. The problem of extracting the moisture has been solved by Mr. Gayley by the adoption of refrigeration by means of anhydrous ammonia. A plant was put in operation at the Isabella furnaces of the Carnegie Steel Company at Pittsburgh on August 11, and remarkable results have been obtained. Prior to its adoption, the furnace from August 1 to August 11 produced on an average 358 tons of pig iron daily with a coke consumption of 2147 lb. Using dry air blast from August 25 to September 9 the daily production of pig iron averaged 447 tons with a coke consumption of 1726 lb. Similar advantages would doubtless be effected in the Bessemer converter, in the open-hearth steel process, in copper smelting, and in other processes where air in large quantities is used.

The next paper read was on the influence of carbon and phosphorus on the strength of iron and steel, by Mr. H. H. Campbell, of Steelton, Pennsylvania.

The paper by Mr. C. V. Bellamy, Director of Public Works, Lagos, was of great ethnological interest. He described the process of iron manufacture in the hinterland of the British colony of Lagos, within twenty days of London, where the methods are the same as those practised by the earliest workers in the metal. The smelting works are near Oyo, the capital of the Yoruba country, and it is only recently that they have been visited by a white man for the first time. Analyses given by Mr. F. W. Harbord, in an appendix to the paper, show that the metal is a pig iron partially decarburised by an oxidising flux. It is really a puddled steel, low in sulphur and phosphorus, its purity accounting for its good qualities.

Mr. J. M. Gledhill read a paper describing the development and rise of high-speed tool steel. Since the initiation of high-speed cutting at the Bethlehem Steel Works, great developments have been made, and results in cutting powers far beyond expectation have been attained. An analysis of one of the best qualities of rapid steels produced by Sir W. G. Armstrong, Whitworth and Co., Ltd., showed 0.55 per cent. of carbon, 3.5 per cent. of chromium, and 13.5 per cent. of tungsten.

The results of different analysts when operating on the same sample of iron or steel are far from concordant, and attempts have been made at various times to investigate the causes of difference. A further attempt has now been made to ascertain the most trustworthy methods for the determination of carbon and phosphorus in steel by a committee consisting of Mr. J. E. Stead, F.R.S., Baron H. von Jüptner (Austria), Mr. A. A. Blair (Philadelphia), and Mr. Gunnar Dillner (Stockholm), who presented an interim report covering fifty-two printed pages.

A paper on acid open-hearth manipulation was submitted by Mr. A. McWilliam and Mr. W. H. Hatfield (Sheffield), in which experimental results were recorded proving that, at about the temperatures occurring in Siemens steel-making practice, the chemical composition of the slag, particularly with regard to its acidity, is the factor which determines whether the percentage of silicon in the molten steel shall increase or decrease.

Mr. E. Demenge (Paris) submitted a paper on the utilisation of exhaust steam, from engines acting intermittently, by means of regenerative steam accumulators and of low-pressure turbines of the Rateau type. The process has been applied with conspicuous success at the Donetz Steel Works in Russia, at the Poensgen Steel Works at Düsseldorf, and at several French collieries.

The meeting concluded with the customary votes of thanks